

## FACE SHIELD ASSEMBLY

## Description

## 1. Technical Field

The present disclosure is directed to a shield to protect the face of a user, and, more particularly to an improved face shield assembly that includes a frame for supporting a protective element without the use of fasteners or the like, which easily and comfortably shields the face of the user, and which provides good visibility.

## 2. Background

The use of face shields to protect a user's eyes and face from various occupational hazards is well known in the art. Face shields are used in numerous professions as protective equipment including, for example, in the chemical, medical, construction, and manufacturing fields. Because face shields are utilized in a wide variety of industries, the requirements for protection can vary from industry to industry. While one industry may require protection against hazardous chemicals, another may require protection against flying debris, still another may require protection against extreme temperatures or light, and others may require protection against undesirable physical contact with body fluids. Thus, developing a face shield that can be utilized for a variety of applications can be a challenging task. In addition, some industries require the use of supplemental protection equipment, such as goggles, respirators and hoods with face shields. In these industries, the face shield must be able to accommodate such accessories. Finally, because people's faces vary widely in size and shape, face shields should be capable of providing protection for a wide variety of users.

Face shields are typically supported on a user's head by a headband, visor, or helmet, with the face shield attached such that it is positioned in front of the user's face during operation. Many face shields can pivot from a lowered position (during use) to an upward position (when not in use). It is common for face shields to be worn for extended periods of time. As such, it is important that the face shield be comfortable to wear. In addition, the face shield should provide adequate protection while not limiting visibility. Thus, proper fit is important because it aids in both comfort and protection. The lens of most face shields come into contact with various types

of debris, all of which can damage the lens, especially over time. Thus, it is also advantageous if the lens can be replaced, as needed, during use. Because many workers use other protection gear, for example gloves, it is also desirable that the removal and insertion of the lens be readily achieved without compromising the security of the lens during use.

While a variety of face shields exist today, there is a continued need in the art for a face shield that has lasting comfort, does not obscure the user's view, provides the desired protection in a variety of applications and for a variety of users, is simple to use, and which provides for quick and easy replacement of the lens during use.

## SUMMARY

It is therefore an object of the face shield assembly disclosed herein to provide a face shield which is comfortable to wear over time, does not unacceptably obscure the user's view, provides the desired protection to the user, is simple to use, and which provides for quick and easy replacement of the lens by the user.

There is provided herein a face shield assembly including a frame and a removable protective element supported by the frame. The protective element is removably supported in an opening of the frame by a channel, without the use of fasteners. Because the face shield lacks fasteners, it is easy to remove and replace, even with the use of gloves. In one embodiment, the frame is molded as a single, unitary member and includes an upper detent, a lower detent and a channel formed between a lip and the frame, the channel receiving an edge of the protective element in order to hold the protective element within the frame. In another embodiment, the frame is pivotally supported on a support structure such that the frame can be moved between an upper (out of use) and a lower (in use) position, and may further include an adjustable mounting member so that the frame can be selectively spaced relative to the user's head.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

It should be understood that the drawings are provided for the purpose of illustration only and are not intended to define the limits of the invention. The foregoing and other objects and advantages of the embodiments described herein will become apparent with reference to the

1 following detailed description when taken in conjunction with the accompanying drawings in  
2 which:

3 FIG. 1 is a front perspective view of a face shield assembly in accordance with the  
4 present invention including a protective element supported within a frame;

5 FIG. 2 is a front perspective view of the face shield assembly of FIG. 1 without the  
6 protective element;

7 FIG. 3 is a perspective view of one embodiment of the protective element of FIG. 1;

8 FIG. 4A is a perspective view of the face shield of Fig. 1 showing insertion of the  
9 protective element within the frame;

10 FIG. 4B is a partially enlarged view of the face shield of Fig. 4A showing insertion of the  
11 protective element within the right side of the frame;

12 FIG. 5 is a partially enlarged view of the face shield of Fig. 1 showing insertion of the  
13 protective element within the top of the frame;

14 FIG. 6 is a partially enlarged view of the face shield of Fig. 1 showing insertion of the  
15 protective element within the bottom of the frame;

16 FIG. 7 is a partially enlarged view of the face shield of Fig. 1 showing insertion of the  
17 protective element within the left side of the frame;

18 FIG. 8 is a left side view of the embodiment of FIG. 1;

19 FIG. 9 is a front view of the embodiment of FIG. 1;

20 FIG. 10 is a cross-sectional view taken along lines 10-10 of FIG. 9;

21 FIG. 11 is a cross-sectional view taken along lines 11-11 of FIG. 9;

22 FIG. 12 is a cross-sectional view taken along lines 12-12 of FIG. 9;

23 FIG. 13 is a rear perspective view of the face shield assembly of FIG. 1 mounted to a  
24 support structure;

25 FIG. 14 is a rear view of the face shield assembly of FIG. 13;

26 FIG. 15 is a perspective view of the support structure of FIG. 13 without the face shield;

27 FIG. 16 is an enlarged, exploded view of the mounting device of the support structure of  
28 FIG. 13;

29 FIG. 17 is an enlarged, partial side view of the ratchet mechanism for the support  
30 structure of FIG. 13 in the first or lowered position;

1 FIG. 18 is a side view of the ratchet mechanism for the support structure of FIG. 13 in the  
2 second or upper position;

3 FIG. 19 is a side view illustrating the face shield mounted to a distal mounting hole of the  
4 support structure;

5 FIG. 20 is a side view illustrating the face shield mounted to a proximal mounting hole of  
6 the support structure in the lowered position;

7 FIG. 21 is a side view illustrating the face shield mounted to a proximal mounting hole of  
8 the support structure in the upper position; and

9 FIG. 22 is a perspective view of the face shield assembly on a user.

10 **DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENTS**

11 A face shield assembly for protecting a user's eyes and face is illustrated in FIGS. 1-22.  
12 The face shield assembly **10** includes a frame **12** and a protective element **14** that is removably  
13 supported in an opening **16** of the frame. The assembly may also include a head worn support  
14 structure **18** for supporting the frame in an upper and lower position, as described in greater  
15 detail below.

16 The frame **12** preferably includes a top portion **20**, a bottom portion **22**, and side portions  
17 **24**. In use, the top portion rests adjacent the forehead and top of the head of a user, while the  
18 bottom portion lies adjacent the jaw of the user, and the side portions are disposed adjacent the  
19 ears of the user (FIG. 19). In the present embodiment, the top, bottom and side portions are  
20 preferably fabricated as a single, unitary member out of a lightweight material, for example  
21 polycarbonate or nylon although other lightweight materials may be utilized, as would be known  
22 to those of skill in the art. An opening **16** that is bounded by an inner edge **25a**, **25b** and **25c** of  
23 the top, bottom and side portions, respectively, of the frame is also provided. The opening **16** is  
24 sized to receive the protective element **14** and preferably extends from a centerline of the face  
25 shield toward the edges of the face shield, so that the frame **12** does not obstruct the peripheral  
26 vision of the user.

27 The protective element **14** may be a lens made of a substantially transparent material,  
28 may be a mesh having very fine openings, or may be made of any other suitable material known  
29 in the art. The protective element **14** is preferably formed as a single, unitary member having a  
30 shape defined by an outer edge **28** (FIG. 3), which is preferably continuous. Because the

1 protective element 14 is supported within the frame 12 without the use of fasteners, there is no  
2 need for any openings for receiving fasteners in the protective element 14.

3 Referring now to Fig. 3, one embodiment of a protective element 14 is illustrated. In this  
4 embodiment the protective element is a lens 15, the lens preferably being substantially planar  
5 (i.e. flat) in the uninstalled position. The lens 15 is preferably injection molded into a sheet made  
6 of, for example, polycarbonate, acrylic, polyester, or any other of a variety of materials that are  
7 well known in the art. Alternately, the lens may not be flat in the uninstalled configuration and  
8 may be molded into a spherical or other rounded shape (not shown). The lens 15 may also be  
9 coated with a variety of chemical coatings, depending upon the particular application. For  
10 example, the lens may include an anti-fog coating, a reflective coating, may have a coating  
11 applied to improve the chemical and/or scratch resistance of the lens, or any other coating as is  
12 well known in the art. The lens is preferably shaped and sized to fit into the shape and size  
13 opening provided in the frame. In the present embodiment, the lens includes a slightly arcuate  
14 upper edge 30, side edges 32, which curve slightly inward from the ends 31a, 31b of the upper  
15 edge, and a lower edge 34 that defines a semi-circular protrusion 36. Alternatively, a variety of  
16 shaped lenses (or protective elements) may be utilized, depending upon the shape of the  
17 corresponding opening, as described above. The lens is sufficiently flexible so that it curves  
18 without fracturing when placed within the opening of the face shield frame 12.

19 Protective element 14 is removably secured within the frame by a groove or channel 38  
20 that is preferably formed between the inner edges 25a,b,c, of the top, bottom and side portions  
21 and a lip 40. As best shown in FIG. 10, the channel 38 is formed between the inner edges 25a-c  
22 of the frame 12 and the lip 40, and is sized to receive the edges of the protective element 14. In  
23 order to more securely fit the protective element into the channel, a plurality of fingers or ridges  
24 42 supported on an inner surface 44 of the lip 40 are preferably provided (See FIG. 7). The  
25 ridges 42 also aid in the manufacturing process of the shell by making the lip more rigid. Any  
26 suitable number of ridges may be provided, as desired. The lip 40 and ridges 42 may also be  
27 formed as a single, unitary piece with the remaining portion of the frame. Alternately, the pieces  
28 may be formed as separate members and joined in any manner, as known to those of skill in the  
29 art.

1           In addition to channel 38, an upper detent 46 and a lower detent 48 are also preferably  
2 provided. The upper and lower detents may be approximately centered on the top inner edge 25a  
3 and bottom inner edge 25b, respectively, of the frame. During use, the detents aid in placement  
4 and securing of the protective element 14 within the opening 16. Both the upper detent 46 and  
5 the lower detent 48 may include one or more ridges 47 to help secure the lens. Once the  
6 protective element 14 is secured within the channel 38 such that it covers the opening 16, a  
7 continuous outer surface is formed to protect the user's eyes and face from external hazards when  
8 the user wears the face shield assembly. As will be appreciated, because no fasteners are  
9 required to secure the protective element to the frame, the user may readily replace the protective  
10 element even with gloved hands. For example, if the lens is damaged it may be replaced, or if  
11 the user is changing applications a lens having different characteristics may be replaced for the  
12 existing lens. As will also be appreciated, because of the lack of fasteners, the inserting and  
13 removing the lens is simple and intuitive, even during the user's first replacement or insertion.  
14 This is true, at least in part, because once the edges are inserted within the channel the lens is self  
15 locating. In other words, there is no need for a specific alignment in order to place holes in a  
16 proper position with corresponding fasteners.

17          In order to secure the face shield frame and protective element in front of the user's face a  
18 head worn support structure 18 may be provided. In the present embodiment, the support  
19 structure may preferably be an adjustable strap style suspension system that fits onto the head of  
20 the user. Such an exemplary system is shown in greater detail in FIGS. 10-17. Alternatively,  
21 other types of support structures, for example hat style structures, may be utilized as is known in  
22 the art. The support structure 18 of the present embodiment preferably includes a first,  
23 adjustable strap 50 that extends around the circumference of the user's head during operation,  
24 and a second, adjustable strap 52 that extends over a top portion of the user's head during use.  
25 Such adjustable circumferential and top straps are known in the art and may be adjusted in any of  
26 a variety of known ways. For example, a knob 54 may be provided to adjust the size of the  
27 circumferential strap 50, while a buckle style adjustment 56 may be utilized to adjust the top  
28 strap 52, as shown in the present embodiment. The adjustability allows for a more comfortable,  
29 custom fit of the support structure on the head of the user.

1           Mounting members 58 are preferably provided to mount the support structure 18 on  
2 either side 24 of the inner surface of the frame 12. In the present embodiment, a fixed mounting  
3 element 59 having a plurality of mounting holes 61 is secured to the inner surface of either side  
4 of the frame. A corresponding, adjustable mounting element 63 is supported on either side of the  
5 support structure. In the present embodiment, the corresponding adjustable mounting elements  
6 are supported below the juncture of the adjustable straps 50, 52. A pair of mounting holes 60a, b  
7 may be provided on the adjustable mounting element 63 so that the frame may be selectively  
8 positioned relative to the user's face. A pair of knobs 62, each having a pin (not shown) are  
9 preferably utilized to support the adjustable mounting elements to the frame. If the pin is  
10 received through the distal mounting hole 60b (FIG. 16) a gap, "G<sub>D</sub>", is formed between the  
11 user's face and an inner surface of the protective element 14. However, if the pin is received  
12 through the proximal mounting hole 60a (FIG. 17) a gap, "G<sub>P</sub>", is formed between the user's face  
13 and an inner surface of the protective element 14. As will be appreciated the distance between  
14 the user's face and the inner surface of the protective element is greater for G<sub>D</sub> than for G<sub>P</sub>. This  
15 allows the user to choose a specific spacing, as desired, during a particular operation. For  
16 example, if the user is wearing goggles with the face shield (as is common for many  
17 applications) then the user will probably choose to use the distal mounting hole 60b in order to  
18 create a greater gap and, hence, room for the goggles.

19           In addition to being able to create an adjustable gap, the mounting members 58 also  
20 preferably include a pin 64 that is selectively engageable with at least two notches 66a, 66b  
21 formed in the mounting member in order to restrain the face shield in either the upper or lower  
22 positions. In the present embodiment, the pin is supported on the fixed mounting element and  
23 the at least two notches are formed in the adjustable mounting element, although the reverse  
24 configuration may also be utilized. A pair of stops 68a, 68b may also be provided in order to  
25 limit the movement of the face shield during use. For example, as shown in FIG. 14, the face  
26 shield is supported on the support structure by the distal mounting hole 60b and is in the lowered  
27 position, i.e. is covering the face of the user. In such a case, the pin 64 is received within first  
28 notch 66a. In order to move the face shield into the upper position, the user would lift the face  
29 shield in the direction of arrow "B" (FIG. 15) thus moving the pin out of the first notch 66a and  
30 into engagement with stop 68b. If, however, the face shield is supported on the support structure

1 by the proximal mounting hole 60a and is in the lowered position the pin 64 would be in  
2 engagement with stop 68a (FIG. 17). As the face shield is lifted into the upper position, the pin  
3 would move into the second notch 66b. In this manner, the face shield is supported in either the  
4 upper or lower position until moved by the user.

5 Use of the face shield of the present embodiment will be described with reference to the  
6 Figures.

7 In use, the straps of the support structure is adjusted to fit the head of the user. The user  
8 can then chose to engage either the distal or proximal mounting holes in order to position the lens  
9 relative to their face, as desired. The lens may then be inserted within the opening in the frame  
10 by first inserting a side edge of the lens into a corresponding portion in the frame channel, and  
11 likewise inserting the top and bottom edges of the lens into the corresponding portion of the  
12 frame channel. The lens is also preferably positioned such that the central portion of the upper  
13 edge of the lens is behind the upper detent of the frame and the central portion of the lower edge  
14 of the lens is behind a lower detent of the frame. Once inserted into the channel, a continuous  
15 surface if formed to cover the opening in the frame and protect the user against unwanted  
16 hazards. The user may then selectively raise and lower the face shield frame, as desired, with at  
17 least two notches and stops holding the frame in position and limiting movement of the shield.

18 The face shield assembly disclosed herein has few moving parts and fasteners making it  
19 both easy to use and lightweight. The lightweight configuration and adjustability also make it  
20 comfortable to wear over extended periods. In addition, the lens is easy to replace and provides  
21 good visibility. The face shield assembly may also be readily adapted for use with other safety  
22 equipment. For example, a detent or snap may be placed on the top of the frame for connection  
23 with a hood and/or respirator.

24 It will be understood that various modifications may be made to the embodiments  
25 disclosed herein. For example, it should be understood that a variety of materials may be utilized  
26 for both the frame and the protective element, that the frame and lens may have alternate shapes  
27 other than those shown, depending upon the particular application, and that the frame need not be  
28 made as a unitary member. In addition, the frame and lens may be mounted to a variety of  
29 support structures. Therefore, the above description should not be construed as limiting, but

1 merely as exemplifications of preferred embodiments. Those skilled in the art will envision other  
2 modifications within the scope, spirit and intent of the invention.

3 WE CLAIM: